R E P O R T R E S U M E S

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THE MAJOR COASTAL COMMUNITIES OF NORTH CAROLINA.

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IDENTIFIED IN THIS MARINE SCIENCE HANDBOOK ARE 5 MAJOR TYPES OF NATURAL HABITATS--(1) OPEN BEACH AND ANY OTHER SEAWARD-FACING, UNPROTECTED STRAND, (2) GROINS, JETTIES, PILINGS, AND ROCK BULKHEADS, (3) SAND AND/OR MUD FLAT, (4) SALT MARSH, AND (5) UPLAND COMMUNITIES. EACH HABITAT IS DESCRIBED IN TERMS OF TYPICAL PLANTS AND ANIMALS, ADAPTATIONS, AND SPECIAL FEATURES. PLANT AND ANIMAL HABITATION IS BROKEN DOWN WHERE APPLICABLE INTO 3 ZONES BASED ON ADAPTATIONS TO THE PHYSICAL FACTORS IN THE ZONES. ILLUSTRATIVE DRAWINGS OF PLANTS AND ANIMALS ARE ACCOMPANIED BY EXPLANATIONS AND GENERIC NAMES. DESCRIPTIONS AND ILLUSTRATIONS ARE PRESENTED IN TERMS OF GRADIENTS WHICH AFFECT LIFE--SALINITY, TEMPERATURE, LIGHT, TEXTURE, CONTENT OF THE SUBSTRATE, AND PHYSICAL DISTURBANCE. (SW)

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MAJOR MARINE COMMUNITIES

OF

CARTERET COUNTY

The out-of-doors is a series of gradients. The more important ones which affect life are salinity, temperature, light, texture and content of the substrate (underlying surface) and physical disturbance. These factors often blend imperceptibly together, but five major types of natural communities are defined clearly enough to justify description:

1. Open beach (Atlantic beach, Fort Macon, and any other seaward-facing, unprotected strand).
2. Groins (Fort Macon), jetties (Radio Island), pilings and rock bulkheads.
3. Sand and/or mud flat (Bird Shoal, flats associated with Middle Marsh and at boundaries between all marshes and open water.
4. Salt marsh (areas adjacent to North River bridge, Crab Point, Morehead-Beaufort causeway and much of eastern Carteret County).
5. Upland communities (dunes, shrub thickets, and maritime forests. Bogs and swamps from where the water table is high).

When considering and comparing such habitats, there is often the temptation to term the environment "harsh" or "favorable". Adjectives such as these are meaningless unless applied to a specific organism. The question is whether or not the organisms

are well adapted. If the organism is not adapted for that habitat, the habitat is, of course, harsh for it. To species which are adapted to the conditions, the environment isn't harsh...it is ideal.

Certain modifications of the general features are peculiar to particular habitats.

A. Open Ocean Sand Beach

1. Special features

a. Physical forces and effects-sand abrasion and surf pounding; shifting sediments offer little opportunity for attachment; inundation by sand.

b. Effects below sand surface- moderate temperature; moderate humidity, poor water retention; oxygen availability reduced; moderate to severe salinity stress; food reduced and disbursed.

c. Effects at surface-wide temperature range; vapor pressure deficits; food (detritus) suspensed in water; no stable surface for grazing.

2. Adaptations

a. Locomotion-well developed, move up and down beach with tides.

b. Burrowing habitats and adaptations-well developed; aid in preventing desiccation and predation.

c. Feeding development generally arthropod type, i.e. sweeping and straining; some predaceous forms, principally annelids; few deposite feeders or sediment ingesters.

3. Open Ocean Beach Community-Typical Plants And Animals (See pages 66-67 of Amos)

a. May be described in distinct zones of plants and animals habitation. Zonation based on elevation of the land and the effects of tides; zones of habitation based on adaptations of plants and animals to the physical factors in the zones.

Zone I. Subtidal, area covered continuously by water, plants and animals can not stand any drying out.

Zone II. Intertidal, are alternately covered by high tides, and exposed to the air at low tide. Plants and animals either move in and out of the area with the tides or burrow under the sand. Excessive wave action and heavy sand movement require special adaptations by inhabitants.

ZONE III. Supratidal, above the influence of tides except during storm tides and hurricanes. Plants and animals adjusted to dry, hot sand. May be subjected to heavy salt spray in the air.

b. Zone I. (Subtidal)

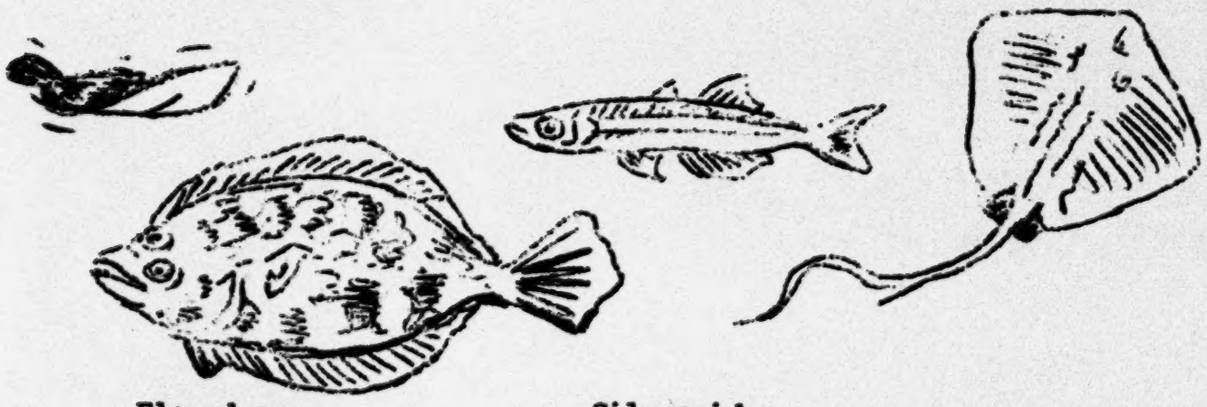
(1) Plants

(a) No large plants. Shifting sands, heavy wave action, and lack of solid bottom prevent attachment. Some floating types of seaweeds may be swept into the area. Many microscopic forms of algae called phytoplankton.

Sargassum Weed (Sargassum sp.) — Large quantities of this seaweed may be swept in to the beach after storms at sea. Tons of Sargassum are carried by currents into the middle Atlantic Ocean. These massive quantities collect in the central Atlantic to form the legendary Sargasso Sea. Unique Sargassum communities may develop in this floating mass.

(2) Animals

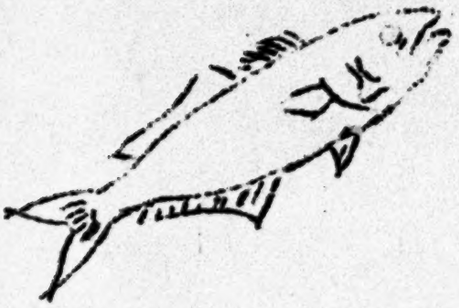
Fish



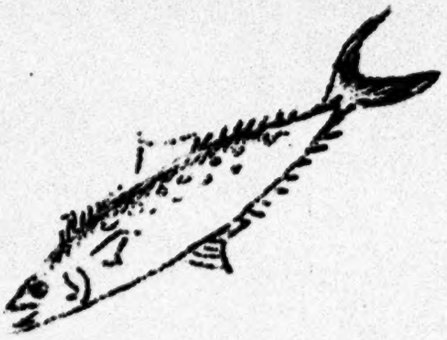
Flounders (Paralichthys sp.) — Silversides (Menidia sp.) — Skates & Rays

Note: The Scientific name included in parentheses below the common name 15 the generic name of one group of these common plants and animals. For instance, there may be many genera of flounder etc. The symbol sp. merely indicates that the species name, which follows the generic name in scientific nomenclature, is not given in this paper. In cases where closely related organisms (in the same genus) are found here (a not uncommon occurance) the species name is included with the generic name in this paper.

Fishes (Cont'd)

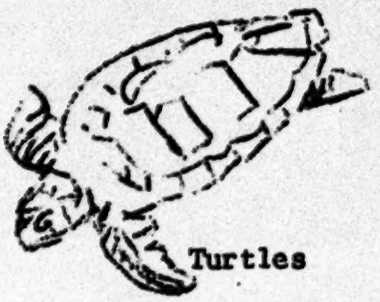


Bluefish
(Pomatomus sp.)



Mackerel
(Scomberomorus sp.)

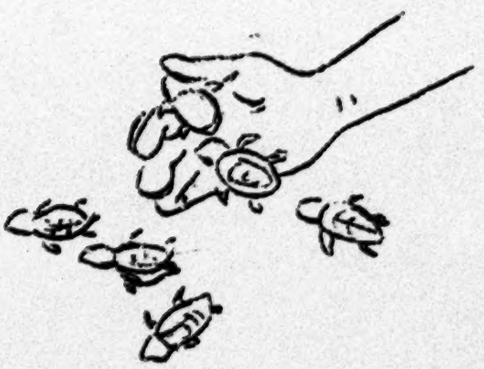
Reptile



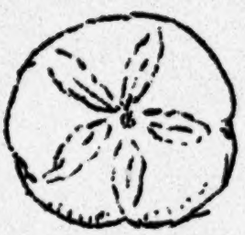
Turtles

(See pp. 166-67 of Amos)

Pinfish
(Lagodon sp.)

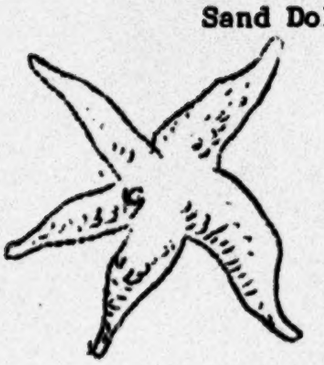


Echinoderms



Sand Dollars

Sea Cucumbers



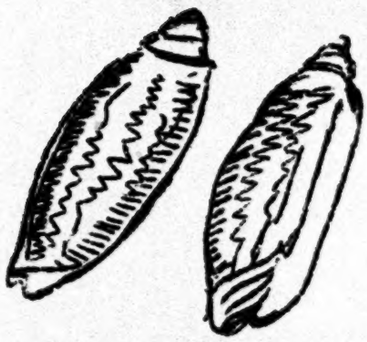
Starfish
(Asterias sp.)

White Sea Urchin
(Lytechinus sp.)

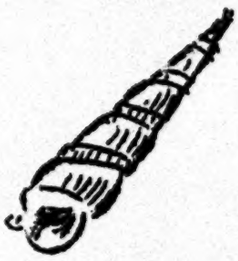
Colored white, oceanic type

Mollusks - have heavy shells and burrow for protection against the rough sand and surf. Very abundant. One-shelled (Gastropod) and two-shelled (Pelecypod) types. Shells often washed on to beach.

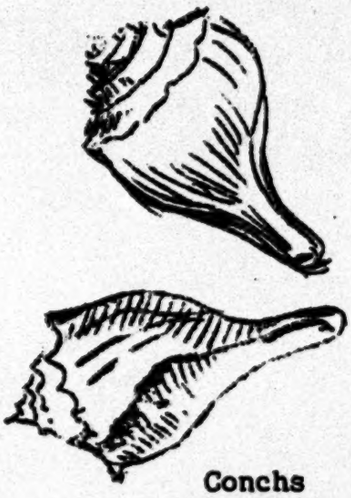
Gastropods



Olive Shell Snail
(*Oliva* sp.)

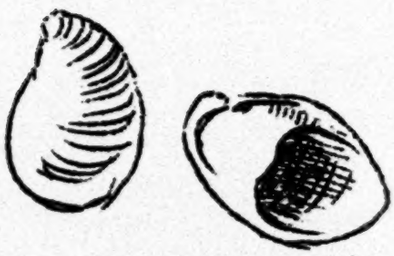


Auger Shells
(*Terebra* sp.)

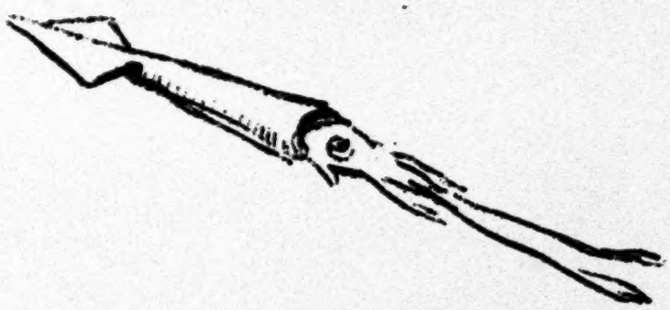


Conchs
(*Busycon* sp.)

Cephalopods (Shell internal)

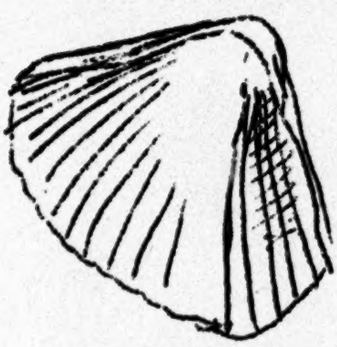


Slipper Shells
(*Crepidula* sp.)



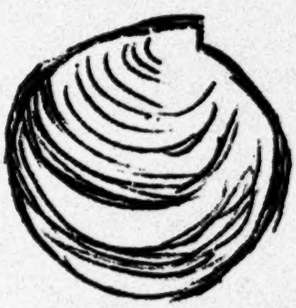
Squid
(*Loligo* sp.)

Pelecypods



Cockles

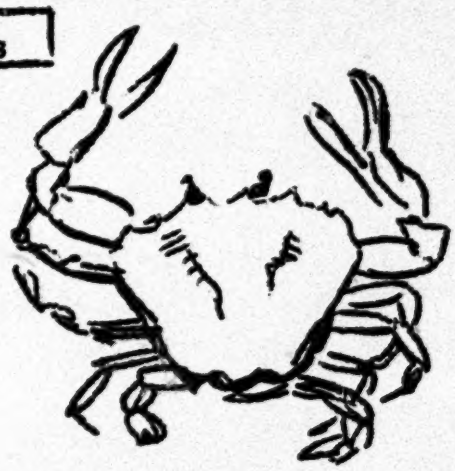
Surf Clams



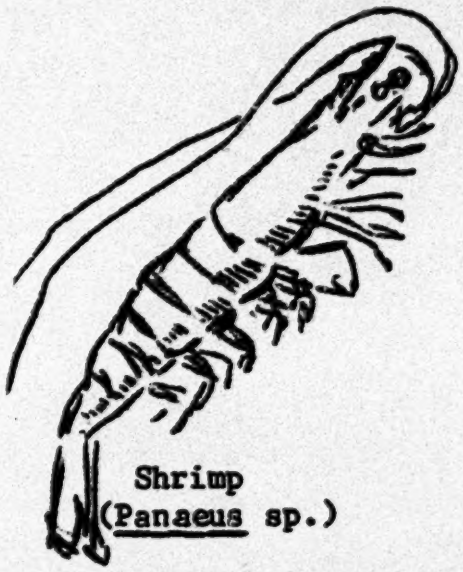
Disk Shells
(*Dosinia* sp.)

Crustaceans

Blue Crab
(Callinectes sp.)



Lady Crab
(Ovalipes sp.)



Shrimp
(Panaeus sp.)

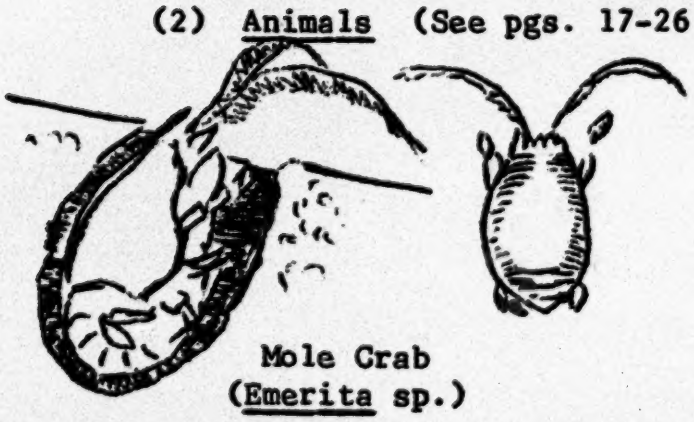
c. Zone II. (Intertidal)

Pounding of waves as breakers descend on the land. Rapid inflow and outflow of sand, waves and tides prevent all but the hardiest of animals from inhabiting this area. Relatively few types (species) of animals live here; those which do are often in great abundance.

(1) Plants

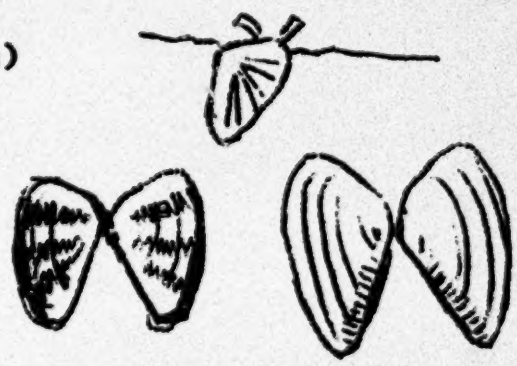
(a) Limited to microscopic plants which are swept in by waves; no permanent standing plants. Dead and decaying plant matter (debris) may be deposited and stranded at the upper tide line. Insects may thrive in this stranded matter.

(2) Animals (See pgs. 17-26 of Amos)



Mole Crab
(Emerita sp.)

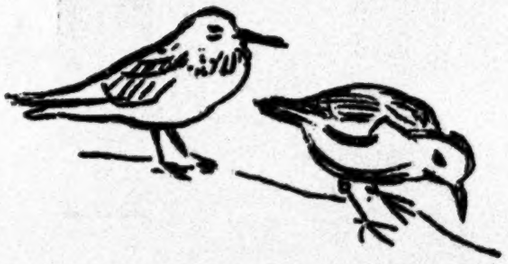
Fascinating little curstaceans which face the oncoming wave and burrow backwards in the shifting sand each time the wave receeds. (See pgs. 19-27 of Amos)



Coquinas
(Donax sp.)

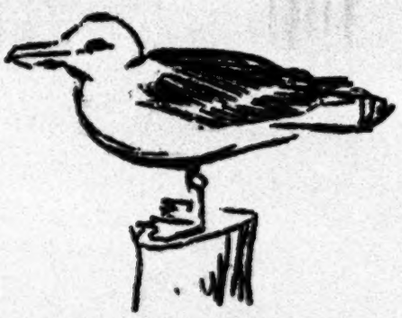
Rapid burrowers which may be swept to the surface with each wave. (See pg 78 of Amos)

Birds- Fly in and out of Zones I and II depending upon the tide. A common avian predator of the Mole Crab is the Sandpiper. Shearwaters and Herring Gulls search for small fish, crabs and clams, diving into the surf when a likely meal is sighted.



Sandpiper
(See pg. 17 of Amos)

"Shearwater"
Black Skimmer

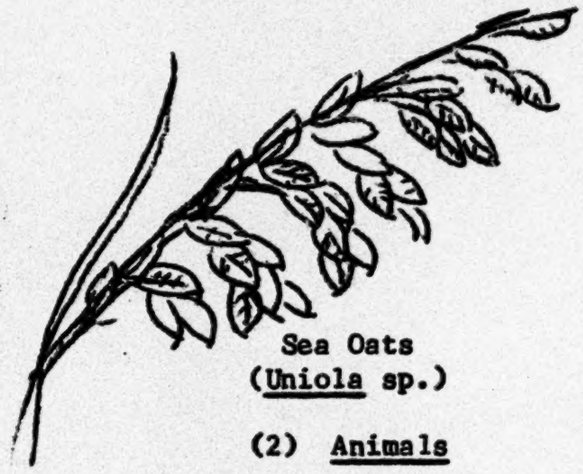


Herring Gull

d. Zone III. (Supratidal)

(1) Plants

(a) Wide stretch of sand uninhabited by plants. On the dunes highly specialized plants are able to grow.



Sea Oats
(Uniola sp.)

Not native south of Hatteras.

American Beach Grass
(Ammophila sp.)

(2) Animals

(a) Specialized for high heat and light intensity. Limited to a very small number. Some small insects.

Ghost Crab (Ocypode sp.)
(See pg. 70 of Amos)

Highly specialized crustacean. Excavates deep tunnel burrows. Rarely comes out during the day; scavenges at night. Can survive in this arid area, but must return to water about once a day to wet its gills, and its eggs must be deposited and hatch in the water.

B. Upland Communities

1. Special features

a. Physical forces - wind a nearly constant factor force, carries salt spray during storms. Both wind and spray decrease with distance from ocean. Reflected light and heat intense on dunes.

b. Effects below ground - ground water is fresh; upper layers dry out quickly, requiring deep root systems; minerals bleach out quickly; low fertility, particularly in nitrogen.

c. Effects at surface - wind carries sand particles across surface, dunes may migrate inland; forests usually stunted; salt spray periodically kills back tips of plant growth near ocean.

2. Adaptations

a. Light and heat- Dune plants have adaptations to prevent water loss; leaves curl, close pores, turn vertical, often fleshy. Adapted to salt spray. Animals burrow. Thickets and forests are largely protected from the beach forces and are much like inland wooded areas.

b. Food supply on dunes is sparse; some rodents, reptiles, and insects adapted to the conditions by foraging at night. Maritime forest animals live much like woodland animals in other areas, using freshwater ponds for water.

3. Upland Communities - Typical Plants and Animals

a. Dunes - Sea Oats (Uniola sp.) and other grasses, fleshy Sea Kale (Cakile sp.) and Sea Elder (Iva sp.);

Yucca, and the milky-stemmed flat mat called Spurge (*Euphorbia* sp.). Of the animals, certain burrowing wasps are characteristic of this area, the Glass Snake (lizard) is a common reptile and mice occur in fair numbers.

b. Shrub thicket and forest - Yaupon (*Ilex vomitoria*) begins in the dunes, as does Red Cedar and Live Oak. They mix with a variety of other shrubs to make thickets behind the dunes, and grow into forests in protected areas with richer soil.

C. Sand and Mud Flat

1. Special features

a. Physical (wave, wind and tide) - quiet waters laden with fine silts, clay and detritus-settling of same; sediments anaerobic (lack oxygen), decomposition of organic matter; oxygen expelled by heat; wave action gentle modified by shallowness of area; salinities higher because of evaporation in tide pools and weeds; thorough tidal flush may occur only at spring tides.

b. Substrate - soft and yielding; smothering of organism by fine silt and anaerobic sediments; fresh water overflow buffered by non-porous sediments; little suitability for for arthropod-type settlers.

2. Adaptations

a. Respiration - modified for low O_2 levels; O_2 intake system extended above bottom; system equipped with a filtering mechanism.

b. Food and feeding - filter feeders select for certain type foods; rapid withdrawal to prevent predation; sense of smell well developed among predaceous forms; little vertical zonation of food items; many permanent and temporary burrows; most sweepers and strainers of the arthropod type absent.

3. Sand and Mud Flat Community - Typical Plants and Animals

a. Usually includes extensive intertidal zone as the flats are shallower over large areas. Particles of fine grained sand may be interspersed or mixed with silty sand;

zonation irregular as a result. Many open ocean beach organisms of Zone I find refuge in the calm waters of the intertidal zone here.

b. Zone I and II (Subtidal and intertidal)

(1) Plants

(a) Larger seaweeds abound here. Free floating forms often litter the shore. Attaching forms flourish wherever find a shell or rock for a solid hold. Zone I noted for the presence of Eel Grass, one of the few seed-bearing marine plants. Cordgrass extends from shore into Zone II. (See pp. 146-151 of Amos)

Sea Lettuce
(Ulva sp.)

Eel Grass
(Zostera sp.)

Cordgrass
(Spartina alterniflora)

(2) Animals

(a) Many burrowing animal forms found near the sand surface in summer; burrow more deeply in winter. Mollusks, annelids, and crustaceans abundant here.

Mollusks

Gastropods

Auger Shells (Terebra sp.)

Conchs (Busycon sp.)

Gastropods (cont.)

Basket Shell
(Nassarius obsoleta)

Prefers muddier bottom. May occur in clumps of several hundred.

Mottled Dog Whelk
(Nassarius vibex)

Species closely related to N. obsoleta. Avoids direct competition by existing in sandier areas.

Pelecypods

Scallops
(Aquipecten sp.)

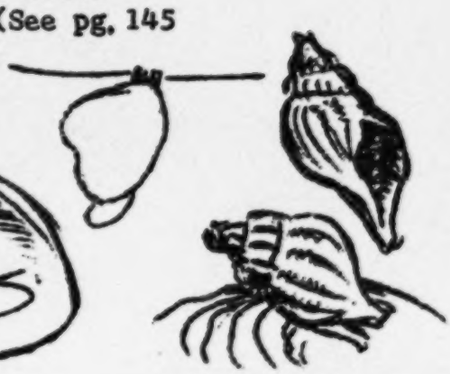
Often found living among blades of the Eel Grass in sandy areas. (See pg. 145 of Amos).

Razor Clams
(Tagelus sp.)

Eastern Oyster
(Crassostrea sp.)

(See pp. 138-145 of Amos)

Hard Clams
(Mercenaria sp.)



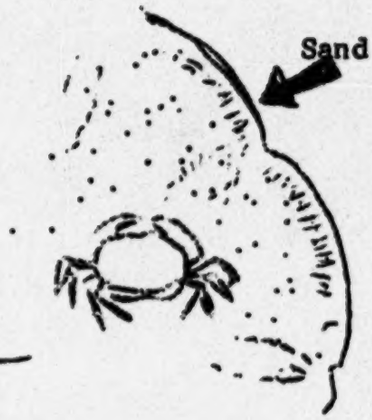
Oyster Drill
(Urosalpinx sp.)

Sunray Clam
(Macrocallista sp.)

Along with the starfish, is one of the chief predators of oysters. (See pg. 142 of Amos)

Arthropods

Striped Hermit Crab
(Pagarus sp.)



Sand Dollar Crab
(Dissodactylus sp.)

A commensal on the under surface of the sand dollar. Very small.

Oyster Crab
(Pinnotheres sp.)

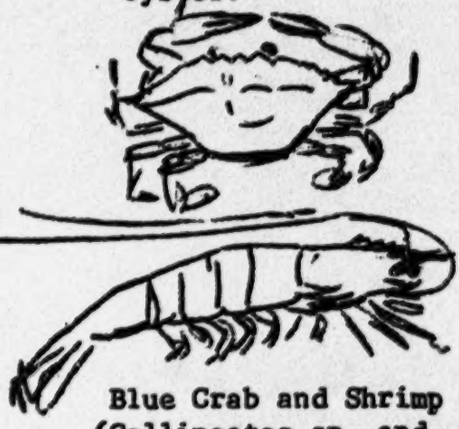
A commensal inside the shell of the oyster.

Horseshoe Crab
(Limulus sp.)

(See pp. 31-35 of Amos)

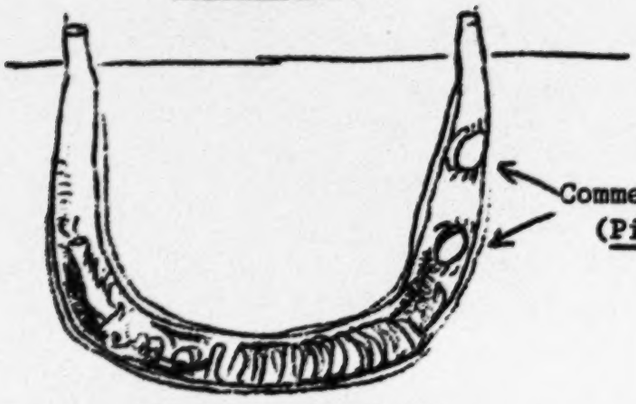
Sand Fiddler Crab
(Uca pugilator)

Prefers a sand bottom for burrowing. Close relative of U. pugnax which lives in the mud of the salt marsh. (See p 35-36 of Amos)



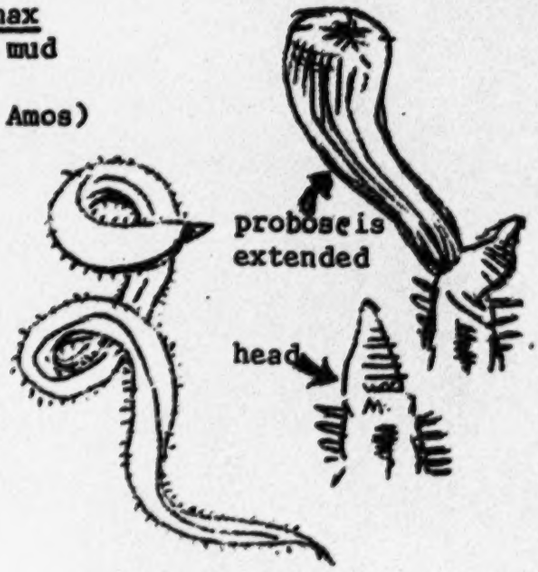
Blue Crab and Shrimp
(Callinectes sp. and several shrimp species)

Annelids



Parchment Tube Worm
(Chaetopterus sp.)

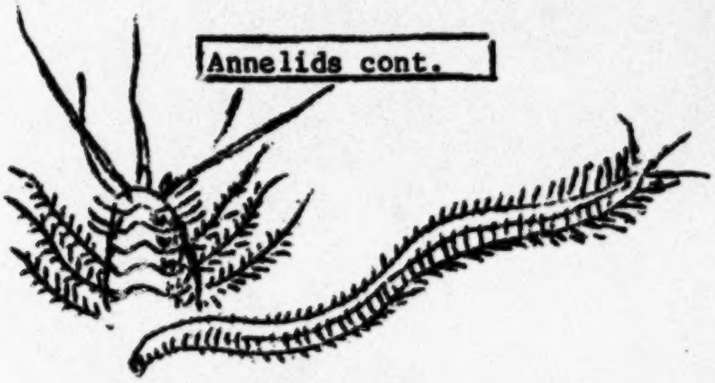
Builds a U-shaped tube in the intertidal zone. Chimneys of these tubes occur as often as 8-9 per square meter. (See pg. 79 of Amos)



Beak Thrower
(Glycera sp.)

Moves freely through sand or water by extending and contracting its beak-like head.

Annelids cont.



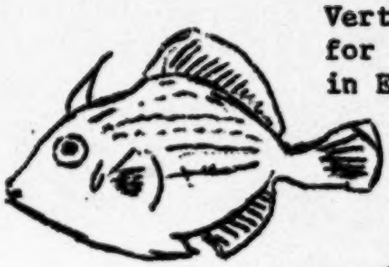
Plumed Worm
(Diopatra sp.)

Very abundant on sand-mud mixed bottom. Tube has a single opening, unlike the Parchment Tube Worm whose home has two openings.

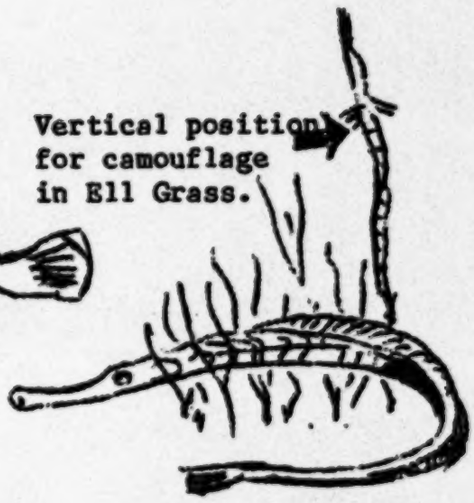
Urochordate

Sea Squirt
(Styela sp.)

Fish



Vertical position for camouflage in Eel Grass.



Killifish
(Fundulus sp.)

Filefish
(Stephanolepis sp.)

Pipefish
(Sygnathus sp.)

Finds protection in Eel Grass beds.

c. Zone III (Supratidal)

(1) In most areas the typical sand-mud flat is located in the intertidal zone. Above the high tide line in Zone III, the habitat is a typical salt marsh situation with the plants and animals typical of the salt marsh community. (See Salt Marsh Community below).

D. Salt Marsh

1. Special features

a. Physical (Wind, wave, tide)- wind stress minimum, prevented by over story of grasses; wave action gentle, tides cause wide salinity changes, high salinity stress; salt and fresh water mix readily because of shallow depth and tidal flush; water generally turbid.

b. Substrate - generally mud with poor oxygen supply, rich in H_2S (hydrogen sulfide which produces that rotten egg smell); occasional molluscan shell remains provide the only solid substrate; roots and stems of grasses intertwined to form dense mat at subsurface.

2. Special adaptations

a. Respiration and osmo-regulation - organisms capable of withstanding wide salinity range (these organisms termed euryhaline); organisms adapted for maximum utilization of limited oxygen; generally larval forms found here, with high gill to body weight ratio; some marine organisms here adapted to feeding out of water.

b. Food and feeding - organisms adapted to utilize vast nutrients available, many larval forms present, often plant eaters; feeding often associated with or at bottom; filter feeders often selective; strong predation from land animals.

3. Salt Marsh Community - Typical Plants and Animals
(See pp. 117-131 of Amos)

a. Rather distinct zones of plants; zonation due to elevation of the land which determines how often or whether the tides bring salt water to the zone. Zonation may be in patches depending upon land elevation since the tide line does not run in a convenient straight line.(See Figure 1 below)

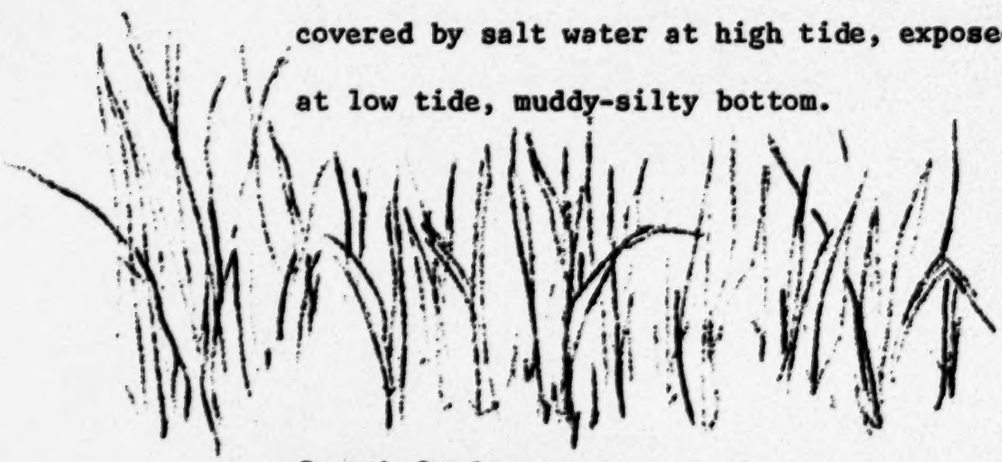
b. Zone I (Subtidal)

(1) Continuously covered by water. Plants and animals are those typically found on a sand-mud flat.

c. Zone II (Intertidal)

(1) Plants

(a) At the lowest elevation, nearest the water, covered by salt water at high tide, exposed at low tide, muddy-silty bottom.



Smooth Cordgrass
(Spartina alterniflora)

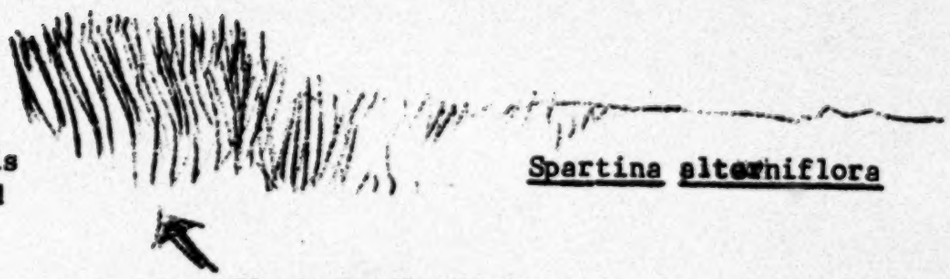
Grows tall at edge of water, but may be stunted in depression areas higher in the marsh where salt water collects and evaporation is high.

(b) In depressions where salt water collects after a high tide, making the soil saltier; usually sandier bottom.

Glasswort
(Salicornia sp.)

Salt content inside plant may be much greater than the water around it. Taste it!

(c) Slightly higher elevation covered by salt water only during unusually high storm tides.

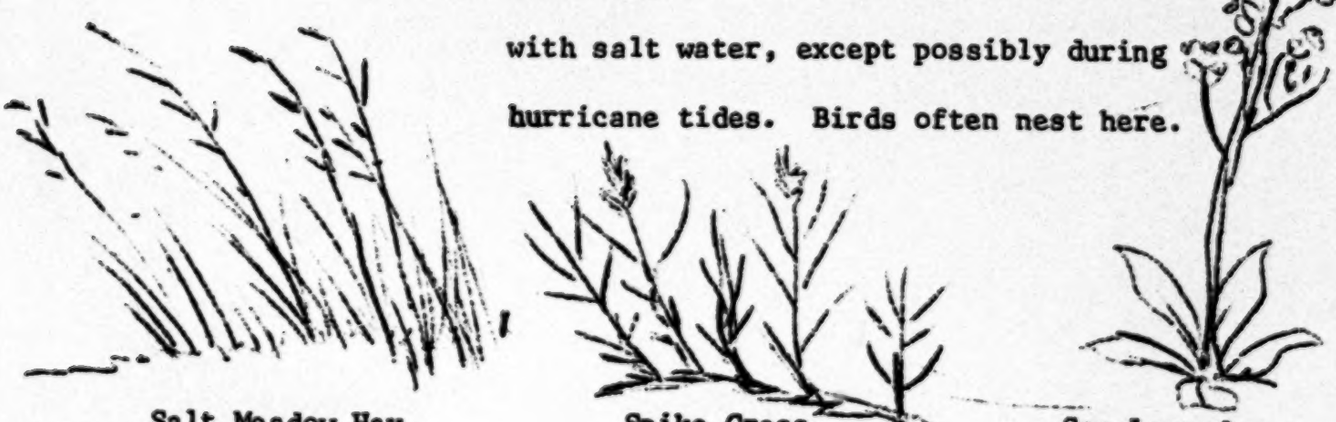


Black Needle Rush
(Juncus sp.)

d. Zone III (Supratidal)

(1) Plants

(a) Still higher in the marsh, rarely flooded with salt water, except possibly during hurricane tides. Birds often nest here.



Salt Meadow Hay
(Spartina patens)

Spike Grass
(Distichlis sp.)

Sea Lavender
(Limonium sp.)

(b) Over the entire marsh which is normally flooded by tides.

Microscopic mud algae; not visible to the naked eye as separate individuals, but may be concentrated in area; in such patches may discolor the substrate in hues of pink, brown, yellow or purple.

(c) Just outside the upper fringes of the marsh, above the influence of salt water.

Sea Mytrle
(Baccharis sp.)

Seaside Goldenrod
(Solidago sp.)

Marsh Elder
(Iva sp.)

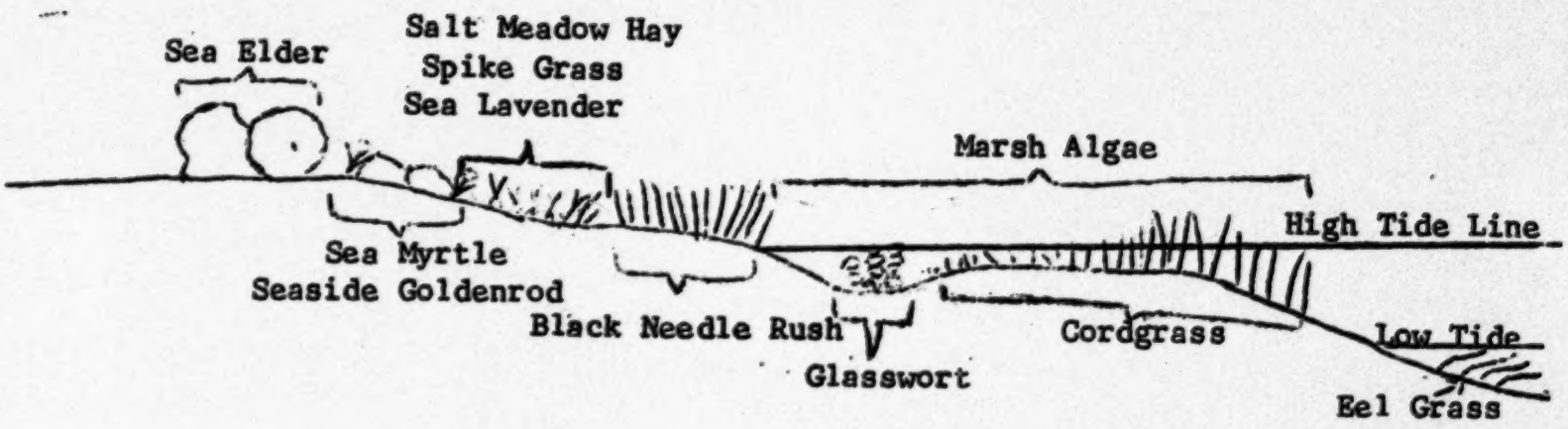


Figure 1. Zonation of plants in a salt marsh community, based on elevations of the land and influence of salt water flooding.

e. Animals in the salt marsh community may be permanent residents, or depending on the tide may move to and from the marsh. Zonation of animals present, but zones less distinct than those of plants in most cases.

f. Zone I (Subtidal)

(1) Most plants and animals here are those typical to a sand-mud flat.

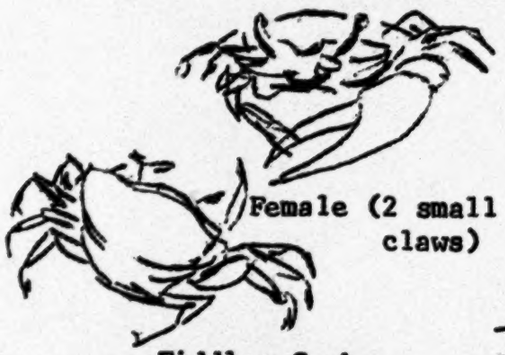
g. Zone II (Intertidal)

(1) Animals

(a) Lower elevation, nearest the water, among the Cordgrass and in the mud.

Male (1 small, 1 large claw)

Female (2 small claws)



Fiddler Crab
(Uca pugnax)

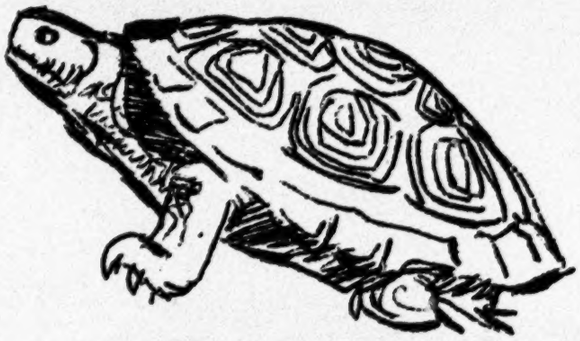
Prefers muddier bottom than its relative U. pugilator.

Permanent

Eastern Oyster
(Crassostrea sp.)

Ribbed Mussel
(Modiolus sp.)

Marsh Crab
(Sesarma sp.)



Diamondback Terrapin
(Mallacemys sp.)

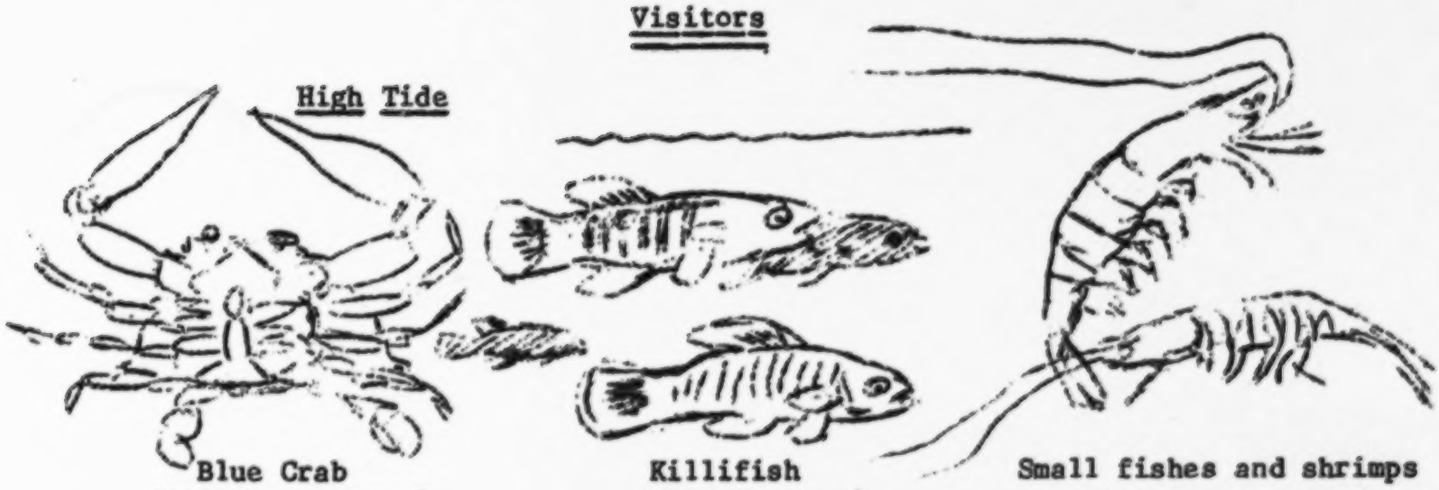
Periwinkles
(Littorina sp.)

Climbs up Cordgrass at high tide.

(b) Many marine worms (Annelids) burrow in the mud of the salt marsh, or move freely through the mud, contributing to aeration of soil.

Visitors

High Tide

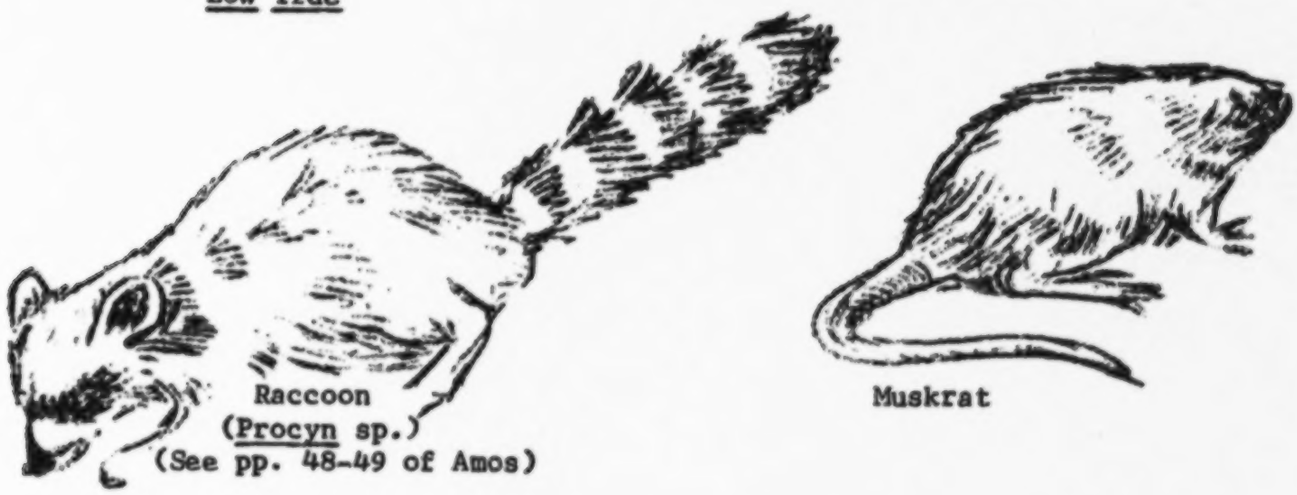


Blue Crab
(Callinectes sp.)

Killifish
(Fundulus sp.)

Small fishes and shrimps

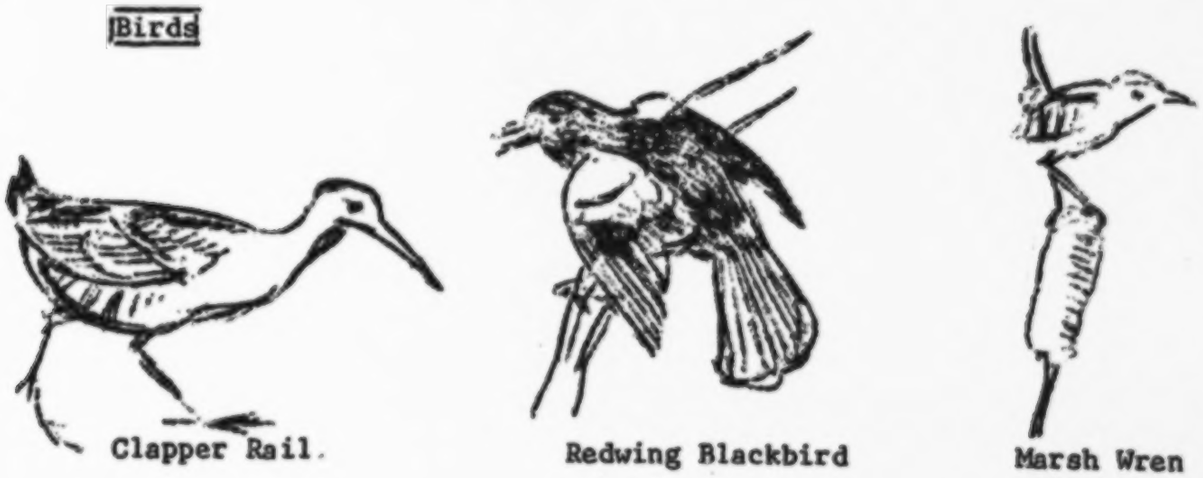
Low Tide



Raccoon
(Procyn sp.)
(See pp. 48-49 of Amos)

Muskrat

Birds



Clapper Rail

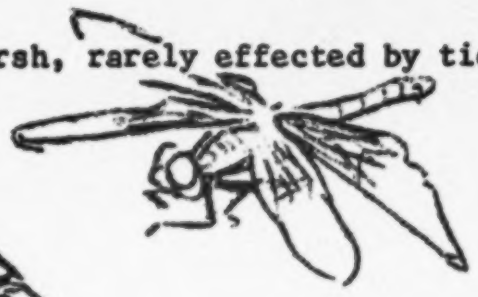
Redwing Blackbird

Marsh Wren

(c) Higher in the marsh, rarely effected by tides.

Marsh Snail
(Melampus sp.)

Meadow Lark



Dragonflies and Mice

E. Rock Shores, Jetties, Groins and Pilings
(See pg. 87 of Amos)

1. Special features

a. Physical (Wave, wind, and tide) - pounding and scouring of surf; scouring by wind and wave driven sand and other suspended material; periodic exposure to air, sun heated surfaces, drying out; exposure to freshets (freshwater runoff from rain); extreme salinity stress; no oxygen deficiency.

b. Substrate - burrowing limited; subject to rapid loss through sweeping away; space competition; limited two-dimensional habitat.

c. Food and feeding - many grazing forms; food shortage in the immediate habitat; limited settling of detritus (for food source); dependence on suspension feeding; periodic exposure to terrestrial predators.

2. Adaptations

a. Body conformation - flat or dome like; sturdily built, shells; hinged or one valve; armored to prevent damage.

b. Locomotion - slow and creeping or sessile (attached); orientation to undersides of rocks and other shaded areas (negative phototaxis - move away from light); strong vertical zonation.

c. Respiration and water retention - impervious body coverings; adaptations against drying out and freshwater overflow; operculum and mucous seals; water retention within shells.

3. Typical Plants and Animals - Rocky Shores, Jetties, Groins and Pilings (See pp. 87-117 of Amos)

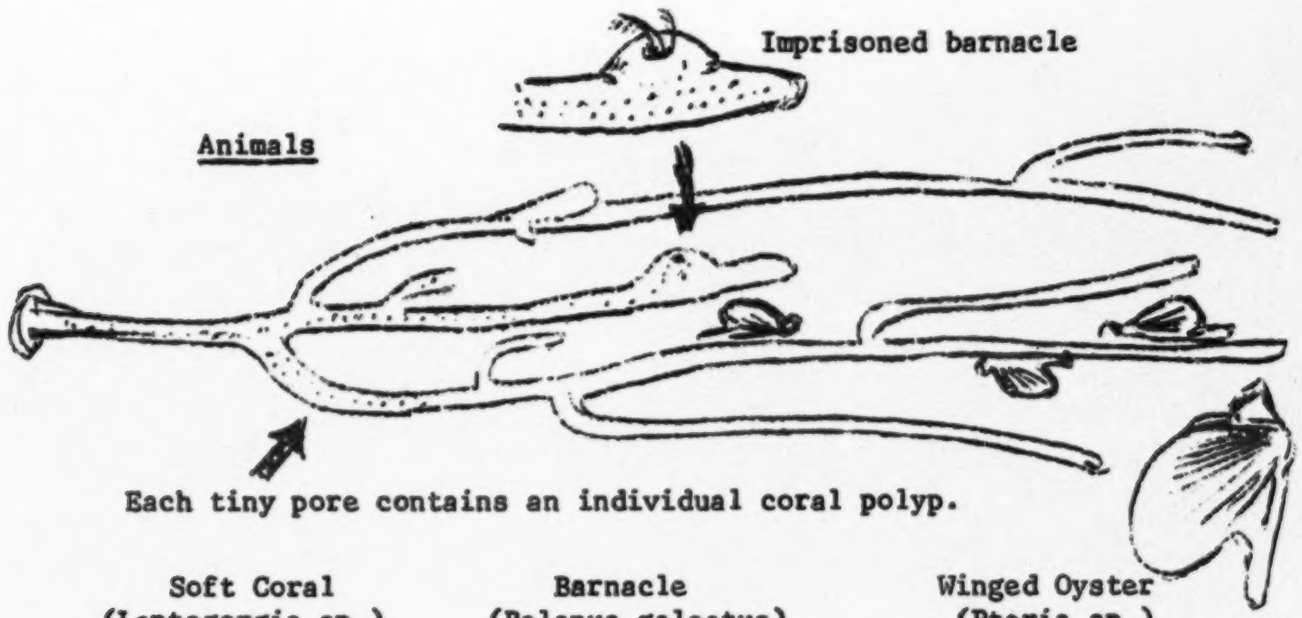
a. Although each of these communities vary with time and place, they have in common the availability of a solid substrate on which organisms can live. Variety of organisms found in these communities differ with the habitat, but most have adaptations which are common to species existing on solid substrates. Characterized by attaching forms which are either very flexible or adapted to withstanding effects of water in areas of heavy wave exposure. Distinct zonation of plants and animals resulting from competition for space and adaptations to physical and chemical factors. (See pg. 87 of Amos)

b. Zone I (Subtidal)

(1) Plants and Animals

(a) Macroscopic (larger) attaching seaweeds; many red algaes, adapted to available light subtidal depths; unable to withstand desiccation.

(b) Many animals which are motile (ability to move) are visitors to this zone and the rock shore community from other communities. Motile intertidal organisms from Zone II move to Zone I during low tide.



Soft Coral
(*Leptogorgia* sp.)

A colonial animal; orange, yellow or rust coloration found here.

Barnacle
(*Balanus galeatus*)

Embeds self as young in *Leptogorgia* sp.; as an adult is a prisoner there.

Winged Oyster
(*Pteria* sp.)

Often clings to branches of *Leptogorgia* sp.

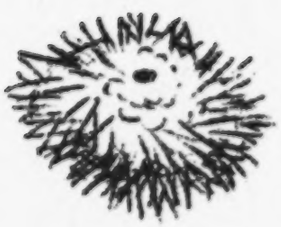
Spiny Oyster
(*Spondylus* sp.)

Limpet
(*Diodora* sp.)

Moves into intertidal zone during high tide. Grazes on algae. To avoid competition with chitons, which have similar living needs may locate self higher in Zone II.

Chiton
(*Chaetopleura* sp.)

Like the Limpet, has specialized shell and foot adapted to withstanding wave action, and as aid in clinging to substrate surface.

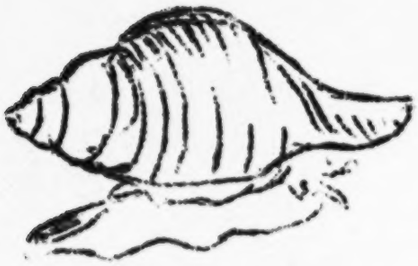


Purple Sea Urchin
(*Arbacia* sp.)

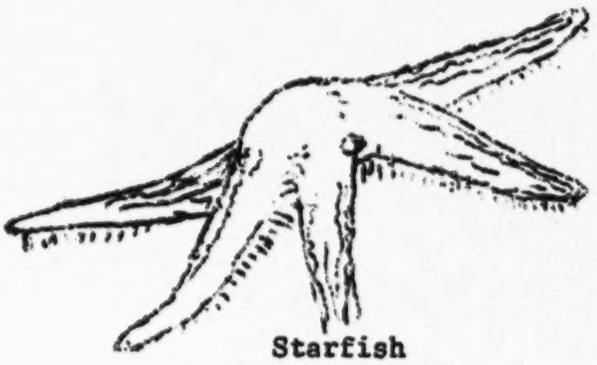
Relative of the oceanic White Sea Urchin. Moves up and down with the tide.

Sea Anemone

Ordinarily moves so slowly as to be undetectable in its movements. Has stinging cells to paralyze prey.



Banded Tulip Shell
(Fasciolaria sp.)



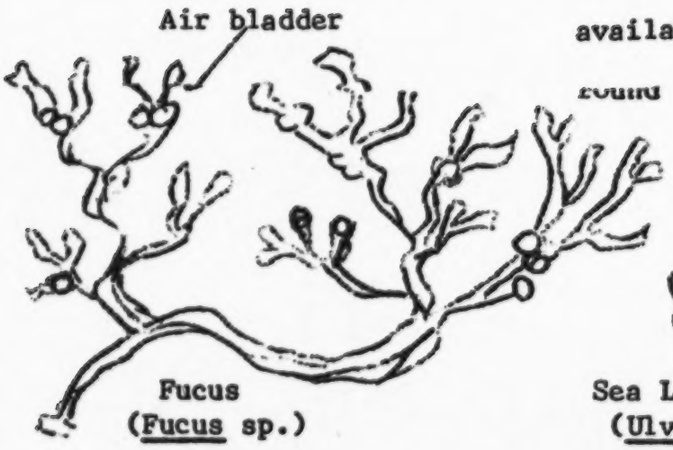
Starfish
(Asterias sp.)

Both of these organisms move in and out of the intertidal zone with the tide.

c. Zone II (Intertidal)

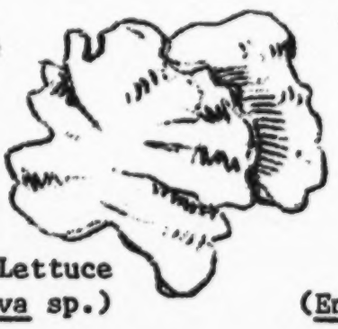
(1) Plants

(a) Macroscopic brown algae at lower intertidal; green algae slightly higher in intertidal. Many "slimy" algal forms tend to cover all available space. Giant Kelp and Rockweed found on more northern and Pacific coasts.



Fucus
(Fucus sp.)

Brown algae, note air bladders on stems.



Sea Lettuce
(Ulva sp.)

Green algae. (See pg. 93 of Amos)

Sea Hair
(Enteromorpha sp.)

Sometimes called Mermaids Hair. Green algae; thread-like strands. (See pp. 90-93 of Amos)

(2) Animals

(a) Subtidal motile organisms move into intertidal zone with the high tide. Noticeable zonation of organisms evident within this zone; i.e., lower intertidal has longer periods of water

innundation, higher intertidal more subject to longer periods of desiccation.

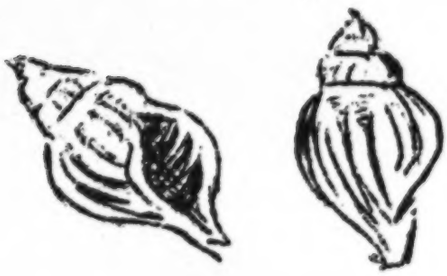
Lower Intertidal

Blue Mussel
(Mytilus sp.)

More common to northern, colder shores. Seldom attain full size here.

Eastern Oyster
(Crassostrea sp.)

Settles above the mussels.



Oyster Drills
(Urosalpinx sp.)

Small, but destructive predator of the oyster.

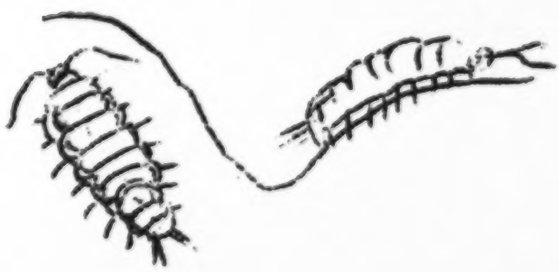
Florida Dye Shell
(Thais sp.)

Larger than Oyster Drill as adults; also prey on oysters.

Upper Intertidal

Common Barnacle
(Balanus eburneus)

(See pg. 96-99 of Amos)



Sea Cockroach
(Ligia sp.)

Moves into supratidal zone at high tide. Commonly seen scurrying over cement breakwater walls.

d. Zone III (Supratidal)

Area subject to salt water and salt spray during spring tides or wave activity.

(1) Plants

(a) Blue-green algaes (Cyanophyta). The green algae Enteromorpha sp. (Sea Hair) also can survive here. In the highest areas of this zone are found lichens encrusting the substrate.

(2) Animals

(a) On rock beaches birds nest in this zone. In this area, the tiny Sea Cockroach is ruler of this zone.